

SEQUENCE LISTING

<110> The Scripps Research Institute
Deiters, Alexander
Cropp, T Ashton
Chin, Jason W
Anderson, J Christopher
Schultz, Peter G

<120> UNNATURAL REACTIVE AMINO ACID GENETIC CODE ADDITIONS

<130> 54-000250US/PC

<160> 104

<170> PatentIn version 3.3

<210> 1
<211> 1275
<212> DNA
<213> Escherichia coli

<400> 1

atggcaagca gtaacttgat taaacaattg caagagcggg ggctggtagc ccaggtgacg	60
gacgaggaag cgtagcaga gcgactggcg caaggccga tcgcgtcta ttgcggcttc	120
gacctaaccg ctgacagctt gcatttgggg catcttgctt cattgttatg cctgaaacgc	180
ttccagcagg cgggccacaa gccggttgcg ctggtaggcg gcgcgacggg tctgattggc	240
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg	300
gtggacaaaa tccgtaagca gggtgccccg ttcctcgatt tcgactgtgg agaaaactct	360
gctatcgcg cgaacaacta tgactggctt ggcaatatga atgtgctgac cttcctgcgc	420
gatattggca aacacttctc cgtaaccag atgatcaaca aagaagcggg taagcagcgt	480
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gttgcagggt	540
tatgacttcg cctgtctgaa caaacgtac ggtgtggtgc tgcaaattgg tggttctgac	600
cagtggggta acatcacttc tggatcgac ctgaccgcgt gtctgcatca gaatcagggtg	660
tttggcctga ccgttccgct gatcactaaa gcagatggca ccaaatttgg taaaactgaa	720
ggcggcgag tctggttggg tccgaagaaa accagcccgt acaaattcta ccagttctgg	780
atcaaacctg cggatgccga cgtttaccgc ttcctgaagt tcttcacctt tatgagcatt	840
gaagagatca acgcctgga agaagaagat aaaaacagcg gtaaagcacc gcgcgcccag	900
tatgtactgg cggagcagg gactcgtctg gttcacgggt aagaagggtt acaggcggca	960
aaacgtatta ccgaatgcct gttcagcggg tctttgagtg cgctgagtga agcggacttc	1020
gaacagctgg cgcaggacgg cgtaccgatg gttgagatgg aaaagggcgc agacctgatg	1080
caggcactgg tcgattctga actgcaacct tcccgtgggtc aggcacgtaa aactatcgcc	1140
tccaatgcca tcaccattaa cgggtgaaaa cagtccgatc ctgaatactt ctttaaagaa	1200
gaagatcgtc tgtttggtcg ttttacctta ctgcgtcgcg gtaaaaagaa ttactgtctg	1260

atttgctgga aataa

1275

<210> 2
 <211> 424
 <212> PRT
 <213> Escherichia coli

<400> 2

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Tyr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Asp Phe Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 3

<211> 1275

<212> DNA

<213> Artificial

<220>

<223> artificial synthetase

<400> 3

atggcaagca gtaacttgat taaacaattg caagagcggg ggctggtagc ccaggtgacg 60
 gacgaggaag cgtagcaga gcgactggcg caaggcccga tcgcactcgt gtgtggcttc 120
 Page 3

gatcctaccg ctgacagctt gcatttgggg catcttggtc cattgttatg cctgaaacgc 180
ttccagcagg cgggccacaa gccgggtgcg ctggtaggcg gcgcgacggg tctgattggc 240
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg 300
gtggacaaaa tccgtaagca ggttgccccg ttcctcgatt tcgactgtgg agaaaactct 360
gctatcgcg ccaataatta tgactgggtc ggcaatatga atgtgctgac cttcctgcgc 420
gatattggca aacacttctc cgtaaccag atgatcaaca aagaagcggg taagcagcgt 480
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggt 540
tatagtatgg cctgtttgaa caaacagtac ggtgtggtgc tgcaaattgg tggttctgac 600
cagtggggta acatcacttc tggatcgac ctgaccgcgt gtctgcatca gaatcagggtg 660
tttggcctga ccgttccgct gatcactaaa gcagatggca ccaaatttgg taaaactgaa 720
ggcggcgag tctggttgga tccgaagaaa accagccgt acaaattcta ccagttctgg 780
atcaacactg cggatgccga cgtttaccgc ttcctgaagt tcttcacct tatgagcatt 840
gaagagatca acgccctgga agaagaagat aaaaacagcg gttaaagcacc gcgcgcccag 900
tatgtactgg cggagcagg gactcgtctg gttcacgggt aagaagggtt acaggcggca 960
aaacgtatta ccgaatgcct gttcagcggg tctttgagt cgctgagtga agcggacttc 1020
gaacagctgg cgcaggacgg cgtaccgatg gttgagatgg aaaagggcgc agacctgatg 1080
caggcactgg tcgattctga actgcaacct tcccggtggtc aggcacgtaa aactatcgcc 1140
tccaatgcc taccattaa cggtgaaaaa cagtccgatc ctgaatactt ctttaaagaa 1200
gaagatcgtc tgtttggctg ttttacetta ctgcgtcgcg gtaaaaagaa ttactgtctg 1260
atttgctgga aataa 1275

<210> 4

<211> 1275

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 4

atggcaagca gtaacttgat taaacaattg caagagcggg ggctggtagc ccaggtgacg 60
gacgaggaag cgtagcaga gcgactggcg caaggcccga tcgcactcac ttgtggcttc 120
gatcctaccg ctgacagctt gcatttgggg catcttggtc cattgttatg cctgaaacgc 180
ttccagcagg cgggccacaa gccgggtgcg ctggtaggcg gcgcgacggg tctgattggc 240
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg 300
gtggacaaaa tccgtaagca ggttgccccg ttcctcgatt tcgactgtgg agaaaactct 360
gctatcgcg ccaataatta tgactgggtc agcaatatga atgtgctgac cttcctgcgc 420

gatattggca aacacttctc cgттаaccag atgatcaaca aagaagcggт taagcagcgt	480
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggт	540
tatacgтatg cctgtctgaa caaacagtac ggtgtggтgc тgcaaattgg тggттctgac	600
cagtggggгta acatcacttc тggтatcgac ctgacccgтc gtctgcatca gaatcaggtg	660
ттtggcctga ccgttccgt gatcactaaa gcagatggca ccaaatttgg таааactgaa	720
ggcgggcgсag тctggттgga тccgaagaaa accagcccgt acaaattcta ccagттctgg	780
atcaacactg cggatgccga cgtttaccgc тtctgaagt тcttcacctt tatgagcatt	840
gaagagatca acgccctgga agaagaagat aaaaacagcg гтааagcacc gcgcgcccag	900
tatgtactgg cggagcaggt gactcgтctg гttcacggтg aagaaggттt acaggcgгca	960
aaacgtatta ccgaatgcct гttcagcggt тctттgagtг cгctgagtga agcggacttc	1020
gaacagctgg cgcaggacgg cgtaccgatg гttgagatgg aaaagggcgс agacctgatg	1080
caggcactgg тcgattctga actgcaacct тcccгtgгtc aggcacgтаa aactatcgcc	1140
тccaatgcca тcaccattaa cggтgaaaaa cagtccgatc ctgaatactt cтттааagaa	1200
gaagatcgтc тgtттggтcg тттtacctta ctgcгtcгcg гтааааagaa тtactgtctg	1260
atttgctgga aataa	1275

<210> 5

<211> 1275

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 5

atggcaagca gтаactтgat тааacaattg caagagcggг ggctggtagc ccaggтgacg	60
gacgaggaag cгtagcaga gcgactggcg caaggcccga тcgactcgт gtgtggcttc	120
gacctaccg ctgacagctt gcatttgggg catcttgтtc cattgttatg cctgaaacgc	180
тtccagcagg cgggccacaa gccgгttгcg ctggtaggcg gcgcgacggг тctgattggc	240
gacccgagct тcaaagctgc cgagcгтаag ctgaacaccg aagaaactgt тcaggagtgg	300
gtggacaaaa тccгтаagca ggttgccccг тtctcgatt тcgactgtgg agaaaactct	360
гctatcgcgг ccaataatta тgactggтtc ggcaatatga atgtгctgac cттcctгcgс	420
gatattggca aacacttctc cгттаaccag atgatcaaca aagaagcggт taagcagcgt	480
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggт	540
tatagtatgg cctgtттgaa caaacagtac ggtgtggтgc тgcaaattgg тggттctgac	600
cagtggggгta acatcacttc тggтatcgac ctgacccgтc gtctgcatca gaatcaggtg	660
ттtggcctga ccgttccgt gatcactaaa gcagatggca ccaaatttgg таааactgaa	720
ggcgggcgсag тctggттgga тccgaagaaa accagcccgt acaaattcta ccagттctgg	780

atcaacactg cggatgccga cgtttaccgc ttcctgaagt tcttcacctt tatgagcatt	840
gaagagatca acgccctgga agaagaagat aaaaacagcg gtaaagcacc gcgcgcccag	900
tatgtactgg cggagcaggt gactcgtctg gttcacggtg aagaagggtt acaggcggca	960
aaacgtatta ccgaatgcct gttcagcggg tctttgagtg cgctgagtga agcggacttc	1020
gaacagctgg cgcaggacgg cgtaccgatg gttgagatgg aaaagggcgc agacctgatg	1080
caggcactgg tcgattctga actgcaacct tcccgtgggc aggcacgtaa aactatcgcc	1140
tccaatgcc a tcaccattaa cggtgaaaaa cagtccgata ctgaatactt ctttaaagaa	1200
gaagatcgtc tgtttggctg ttttacctta ctgcgtcgcg gtaaaaagaa ttactgtctg	1260
atttgctgga aataa	1275

<210> 6
 <211> 1275
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 6	
atggcaagca gtaacttgat taaacaattg caagagcggg ggctggtagc ccagggtgacg	60
gacgaggaag cgtagcaga gcgactggcg caaggcccga tcgcactcgt gtgtggcttc	120
gacccactcg ctgacagctt gcatttgggg catcttgctt cattgttatg cctgaaacgc	180
ttccagcagg cgggccacaa gccgggtgcg ctggtaggcg gcgcgacggg tctgattggc	240
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg	300
gtggacaaaa tccgtaagca ggttgccccg ttcctcgatt tcgactgtgg agaaaactct	360
gctatcgcg ccaataatta tgactggctt ggcaatatga atgtgctgac cttcctgcgc	420
gatattggca aacacttctc cgtaaccag atgatcaaca aagaagcggg taagcagcgt	480
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggt	540
tatagtatgg cctgtttgaa caaacagtac ggtgtggtgc tgcaaattgg tggttctgac	600
cagtggggta acatcacttc tggatatgac ctgacccgtc gtctgcatca gaatcagggtg	660
tttggcctga ccgttccgct gatcactaaa gcagatggca ccaaatttgg taaaactgaa	720
ggcggcgcag tctggttgga tccgaagaaa accagcccgt acaaattcta ccagttctgg	780
atcaacactg cggatgccga cgtttaccgc ttcctgaagt tcttcacctt tatgagcatt	840
gaagagatca acgccctgga agaagaagat aaaaacagcg gtaaagcacc gcgcgcccag	900
tatgtactgg cggagcaggt gactcgtctg gttcacggtg aagaagggtt acaggcggca	960
aaacgtatta ccgaatgcct gttcagcggg tctttgagtg cgctgagtga agcggacttc	1020
gaacagctgg cgcaggacgg cgtaccgatg gttgagatgg aaaagggcgc agacctgatg	1080

caggcactgg tcgattctga actgcaacct tcccgtgggc aggcacgtaa aactatcgcc 1140
 tccaatgcca tcaccattaa cgggtgaaaaa cagtccgata ctgaatactt ctttaaagaa 1200
 gaagatcgtc tgtttggtcg ttttacetta ctgcgtcgcg gtaaaaagaa ttactgtctg 1260
 atttgctgga aataa 1275

<210> 7
 <211> 1275
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 7
 atggcaagca gtaacttgat taaacaattg caagagcggg ggctggtagc ccagggtgacg 60
 gacgaggaag cgtagcaga gcgactggcg caaggcccgga tcgcactcac gtgtggcttc 120
 gatcctaccg ctgacagctt gcatttgggg catcttgctc cattgttatg cctgaaacgc 180
 ttccagcagg cgggccacaa gccgggtgcg ctggtaggcg gcgcgacggg tctgattggc 240
 gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg 300
 gtggacaaaa tccgtaagca gggtgccccg ttcctcgatt tcgactgtgg agaaaactct 360
 gctatcgagg ccaataatta tgactggctc ggcaatatga atgtgctgac ctctctgcgc 420
 gatattggca aacacttctc cgtaaccag atgatcaaca aagaagcggg taagcagcgt 480
 ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacagcct gctgcagggt 540
 tatacgatgg cctgtctgaa caaacgtac ggtgtggtgc tgcaaattgg tggttctgac 600
 cagtggggta acatcacttc tggatcgac ctgaccgcgc gtctgcatca gaatcagggtg 660
 tttggcctga ccgttccgct gatcactaaa gcagatggca ccaaatttgg taaaactgaa 720
 ggcggcgcag tctggttga tccgaagaaa accagcccgt acaaattcta ccagttctgg 780
 atcaacactg cggatgccga cgtttaccgc ttcctgaagt tcttcacctt tatgagcatt 840
 gaagagatca acgccctgga agaagaagat aaaaacagcg gtaaagcacc gcgcgcccag 900
 tatgtactgg cggagcagggt gactcgtctg gttcacgggt aagaagggtt acaggcggca 960
 aaacgtatta ccgaatgcct gttcagcggg tctttgagtg cgctgagtga agcggacttc 1020
 gaacagctgg cgcaggacgg cgtaaccgat gttgagatgg aaaagggcgc agacctgatg 1080
 caggcactgg tcgattctga actgcaacct tcccgtgggc aggcacgtaa aactatcgcc 1140
 tccaatgcca tcaccattaa cgggtgaaaaa cagtccgata ctgaatactt ctttaaagaa 1200
 gaagatcgtc tgtttggtcg ttttacetta ctgcgtcgcg gtaaaaagaa ttactgtctg 1260
 atttgctgga aataa 1275

<210> 8
 <211> 540

<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<400> 8
 cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcacttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcagcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatacg tatgcctgtc tgaacaaaca gtacgggtgtg 540

<210> 9
<211> 540
<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<400> 9
 cgggggctgg taccacaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcacttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcagcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatacg tatgcctgtc tgaacaaaca gtacgggtgtg 540

<210> 10
<211> 540
<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<400> 10
 cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60

ccgatcgac tcacttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
gttcattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggtgc cccgttcctc 300
gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcagcaat 360
atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
aacaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
tttctctaca acctgctgca gggttatacg tatgcctgtc tgaacaaaca gtacgggtgtg 540

<210> 11
<211> 540
<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<400> 11
cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
ccgatcgac tcacttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
gttcattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggtgc cccgttcctc 300
gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
aacaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
tttctctaca acctgctgca gggttattcg tatgcctgtg cgaacaaaca gtacgggtgtg 540

<210> 12
<211> 540
<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<400> 12
cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
ccgatcgac tcacttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
gttcattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggtgc cccgttcctc 300
gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcagcaat 360

atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca ggggtatagc tatgcctgtc tgaacaaaca gtacgggtgtg 540

<210> 13
 <211> 540
 <212> DNA
 <213> artificial

<220>

<223> artificial synthetase

<400> 13

cgggggctgg taccacaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcctttgtgg cttcgatcct accgctgaca gcttgcatctt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcgggcc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca ggggtattct attgcctgtt cgaacaaaca gtacgggtgtg 540

<210> 14
 <211> 540
 <212> DNA
 <213> artificial

<220>

<223> artificial synthetase

<400> 14

cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcgtgtgtgg cttcgatcct accgctgaca gcttgcatctt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcgggcc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca ggggtatagt attgcctgtt tgaacaaaca gtacgggtgtg 540

<210> 15

<211> 540
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 15
 cgggggctgg taccccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcgtgtgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcgggcc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatagt attgcctgtt tgaacaaaca gtacggtgtg 540

<210> 16
 <211> 540
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 16
 cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tctgggtgtg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcgggcc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaagg ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaatt gttatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatatg cgtgcctgtg agaacaaaca gtacggtgtg 540

<210> 17
 <211> 624
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 17
 cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60

```

ccgatcgac tcatttgtgg ctctgatcct accgctgaca gcttgcattt ggggcatctt 120
gttcatttgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
ggcggcgcca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggttg cccgttcctc 300
gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
atgaatgtgc tgaccttctc gcgcgatatt ggcaaact tctccgttaa ccagatgatc 420
aacaagaag cggttaagca gcgtctcaac cgtgaaggct aggggatttc gttcactgag 480
tttctctaca acctgctgca gggttatggt atggcctgtg ctaacaaaca gtacggtgtg 540
gtgctgcaaa ttggtggttc tgaccaatgg ggtaacatca cttctggtat cgacctgacc 600
cgctgtctgc atcagaatca ggtg 624

```

<210> 18
 <211> 609
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

```

<400> 18
caggtagcgg acgaggaagc gtttagcagag cgactggcgc aaggcccgat cgactcgggt 60
tgtggcttcg atcctaccgc tgacagcttg catttggggc atcttgttcc attggtatgc 120
ctgaaadgct tccagcaggc gggccacaag ccggttgccg tggtaggcgg cgcgacgggt 180
ctgattggcg acccgagctt caaagctgcc gagcgtaagc tgaacaccga agaaactggt 240
caggagtggg tggacaaaat ccgtaagcag gttgccccgt tcctcgattt cgactgtgga 300
gaaaactctg ctatcgcggc caataattat gactgggttc gcaatatgaa tgtgctgacc 360
ttcctgcgcg atattggcaa acacttctcc gttaaccaga tgatcaacaa agaagcgggt 420
aagcagcgtc tcaaccgtga agatcagggg atttcgttca ctgagttttc ctacaacctg 480
ctgcagggtt atggttttgc ctgtttgaac aaacagtacg gtgtggtgct gcaaattggt 540
ggttctgacc agtggggtaa catcacttct ggtatcgacc tgaccgctcg tctgcatcag 600
aatcaggtg 609

```

<210> 19
 <211> 591
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

```

<400> 19
gcgttagcag agcgactggc gcaaggcccg atcgactcgg ggtgtggctt cgatcctacc 60

```

```

gctgacagct tgcatttggg gcattcttgtt ccattgttat gcctgaaacg cttccagcag      120
gcggggccaca agccgggttgc gctggttaggc ggcgcgacgg gtctgattgg cgacccgagc      180
ttcaaagctg ccgagcgtaa gctgaacacc gaagaaactg ttcaggagtg ggtggacaaa      240
atccgtaagc aggttgcccc gttcctcgat ttcgactgtg gagaaaactc tgctatcgcg      300
gccaataatt atgactgggtt cggcaatatg aatgtgctga ccttcctgcg cgatattggc      360
aaacacttct ccgttaacca gatgatcaac aaagaagcgg ttaagcagcg tctcaaccgt      420
gaagatcagg ggatttcggt cactgagttt tcctacaacc tgctgcaggg ttatggttat      480
gcctgtatga acaaacagta cgggtgtggtg ctgcaaattg gtggttctga ccagtggggt      540
aacatcactt ctggtatcga cctgaccctg cgtctgcacg agaatcaggt g              591

```

```

<210> 20
<211> 621
<212> DNA
<213> artificial

```

```

<220>
<223> artificial synthetase

```

```

<220>
<221> misc_feature
<222> (26)..(26)
<223> n is a, c, g, or t

```

```

<220>
<221> misc_feature
<222> (612)..(612)
<223> n is a, c, g, or t

```

```

<220>
<221> misc_feature
<222> (618)..(618)
<223> n is a, c, g, or t

```

```

<400> 20
gggctggtag cccaggtgac ggacgnagaa gcgttagcag agcgactggc gcaaggcccc      60
atcgcaactcc tttgtggctt cgatcctacc gctgacagct tgcatttggg gcattcttgtt      120
ccattgttat gcctgaaacg cttccagcag gcggggccaca agccgggttgc gctggttaggc      180
ggcgcgacgg gtctgattgg cgacccgagc ttcaaagctg ccgagcgtaa gctgaacacc      240
gaagaaactg ttcaggagtg ggtggacaaa atccgtaagc aggttgcccc gttcctcgat      300
ttcgactgtg gagaaaactc tgctatcgcg gccaataatt atgactgggt cggcaatatg      360
aatgtgctga ccttcctgcg cgatattggc aaacacttct ccgttaacca gatgatcaac      420
aaagaagcgg ttaagcagcg tctcaaccgt gaagatcagg ggatttcggt cactgagttt      480
tcctacaacc tgctgcaggg ttatttctat gcctgtgcga acaaacagta cgggtgtggtg      540
ctgcaaattg gtggttctga ccagtggggt aacatcactt ctggtatcga cctgaccctg      600
cgtctgcacg anaatcangt g              621

```

<210> 21
 <211> 588
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 21
 ttagcagagc gactggcgca aggcccgatc gcactcgttt gtggcttcga tcctaccgct 60
 gacagcttgc atttggggca tcttgttcca ttgttatgcc tgaaacgctt ccagcaggcg 120
 ggccacaagc cggttgcgct ggtaggcggc gcgacgggtc tgattggcga cccgagcttc 180
 aaagctgccg agcgtaagct gaacaccgaa gaaactgttc aggagtgggt ggacaaaatc 240
 cgtaagcagg ttgccccgtt cctcgatttc gactgtggag aaaactctgc tatcgcggcc 300
 aataattatg actggttcgg caatatgaat gtgctgacct tcctgcgcga tattggcaaa 360
 cacttctccg ttaaccagat gatcaacaaa gaagcgggta agcagcgtct caaccgtgaa 420
 gatcagggga tttcgttcac tgagttttcc tacaacctgc tgcaggggta ttctgcggcc 480
 tgtgcgaaca aacagtacgg tgtggtgctg caaattggtg gttctgacca gtgggggtaac 540
 atcacttctg gtatcgacct gaccgctcgt ctgcatcaga atcaggtg 588

<210> 22
 <211> 600
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<220>
 <221> misc_feature
 <222> (403)..(403)
 <223> n is a, c, g, or t

<220>
 <221> misc_feature
 <222> (513)..(513)
 <223> n is a, c, g, or t

<220>
 <221> misc_feature
 <222> (515)..(515)
 <223> n is a, c, g, or t

<220>
 <221> misc_feature
 <222> (518)..(518)
 <223> n is a, c, g, or t

<220>
 <221> misc_feature
 <222> (531)..(531)
 <223> n is a, c, g, or t

<400> 22
gacgaggaag cgtagcaga gcgactggcg caaggcccg tgcactcct gtgtggcttc 60
gatcctaccg ctgacagctt gcatttgggg catcttggtc cattgttatg cctgaaacgc 120
ttccagcagg cggggccacaa gccggttgcg ctggtaggcg gcgcgacggg tctgattggc 180
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg 240
gtggacaaaa tccgtaagca ggttgccccg ttcctcgatt tcgactgtgg agaaaactct 300
gctatcgcg ccaataatta tgactgggtc ggcaatatga atgtgctgac cttcctgcgc 360
gatattggca aacacttctc cgtaaccag atgatcaaca aanaagcggg taagcagcgt 420
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggt 480
tattcggctg cctgtgcgaa caaacagtac gngngngngc tgcaaattgg nggttctgac 540
caggggggta acatcacttc tggatcgac ctgaccgcgc gtctgcatca aaatcagggtg 600

<210> 23
<211> 591
<212> DNA
<213> artificial

<220>
<223> artificial synthetase

<220>
<221> misc_feature
<222> (588)..(588)
<223> n is a, c, g, or t

<400> 23
gcgtagcag agcgactggc gcaaggcccg atcgactcg tttgtggctt cgatcctacc 60
gctgacagct tgcatttggg gcatcttggt ccattgttgt gcctgaaacg cttccagcag 120
gcggggccaca agccggttgc gctggtaggc ggcgcgacgg gtctgattgg cgacccgagc 180
ttcaaagctg ccgagcgtaa gctgaacacc gaagaaactg ttcaggagtg ggtggacaaa 240
atccgtaagc aggttgcccc gttcctcgat ttcgactgtg gagaaaactc tgctatcgcg 300
gccaataatt atgactgggt cggcaatatg aatgtgctga ccttcctgcg cgatattggc 360
aaacacttct ccgttaacca gatgatcaac aaagaagcgg ttaagcagcg tctcaaccgt 420
gaagatcagg ggatttcggt cactgagttt tctacaacc tgctgcaggg ttatagtgcg 480
gcctgtgtta acaaacagta cgggtgtggt ctgcaaattg gtggttctga ccagtggggg 540
aacatcactt ctggtatcga cctgaccggt cgtctgcac agaatcangt g 591

<210> 24
<211> 600
<212> DNA
<213> artificial

<220>

<223> artificial synthetase

<400> 24

```

gacgaggaag cgtagcaga gcgactggcg caaggcccga tcgcactcat ttgtggcttc      60
gacactaccg ctgacagctt gcatttgggg catcttggtc cattgttatg cctgaaacgc      120
ttccagcagg cgggccacaa gccggttgcg ctggtaggcg gcgcgacggg tctgattggc      180
gacccgagct tcaaagctgc cgagcgtaag ctgaacaccg aagaaactgt tcaggagtgg      240
gtggacaaaa tccgtaagca gggtgccccg ttcctcgatt tcgactgtgg agaaaactct      300
gctatcgcgg ccaatgatta tgactgggtc ggcaatatga atgtgctgac cttcctgcgc      360
gatattggca aacacttctc cgtaaccag atgatcaaca aagaagcggg taagcagcgt      420
ctcaaccgtg aagatcaggg gatttcgttc actgagtttt cctacaacct gctgcagggg      480
tataattttg cctgtgtgaa caaacagtac ggtgtggtgc tgcaaattgg tggttctgac      540
cagtggggta acatcacttc tggatcgac ctgaccgcgc gtctgcatca gaatcaggtg      600

```

<210> 25

<211> 579

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 25

```

cgactggcgc aaggcccgat cgcactcacg tgtggcttcg atcctaccgc tgacagcttg      60
catttggggc atcttggtcc attggttatgc ctgaaacgct tccagcaggc gggccacaag      120
ccggttgcgc tggtaggcgg cgcgacgggt ctgattggcg acccgagctt caaagctgcc      180
gagcgtaagc tgaacaccga agaaactgtt caggagtggg tggacaaaat ccgtaagcag      240
gttgccccgt tcctcgattt cgactgtgga gaaaactctg ctatcgcggc caataattat      300
gactggttcg gcaatatgaa tgtgctgacc ttcctgcgcg atattggcaa acacttctcc      360
gttaaccaga tgatcaacaa agaagcgggt aagcagcgtc tcaaccgtga agatcagggg      420
atttcgttca ctgagttttc ctacaatctg ctgcaggggt attcggctgc ctgtcttaac      480
aaacagtacg gtgtgggtgct gcaaattggg ggttctgacc agtggggtaa catcacttct      540
ggtatcgacc tgaccgcgcg tctgcatcag aatcaggtg                               579

```

<210> 26

<211> 624

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<220>

<221> misc_feature

<222> (13)..(13)
 <223> n is a, c, g, or t

<220>
 <221> misc_feature
 <222> (599)..(599)
 <223> n is a, c, g, or t

<400> 26
 cggggggctgg tancccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgategcac tcgggtgtgg cttegatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttctaca acctgctgca gggttattct atggcctgtt tgaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttggtggttc tgaccagtgg ggtaacatca cttctggtat cgacctganc 600
 cgtcgtctgc atcagaatca ggtg 624

<210> 27
 <211> 625
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<220>
 <221> misc_feature
 <222> (600)..(600)
 <223> n is a, c, g, or t

<400> 27
 cggggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgategcac tcacgtgtgg cttegatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttctaca atctgctgca gggttattcg gctgcctgtc ttaacaaaca gtacgggtgtg 540

gtgctgcaaa ttggtggttc tgaccagtgg ggtaacatca cttctggtat cgaacctgan 600
 ccgtcgtctg catcaaaatc aagtg 625

<210> 28
 <211> 624
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 28
 cgggggctgg taccccaagt gacggacgag gaaacgttag cagagcgact ggcgcaaggc 60
 ccgatcgac tctcttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcaggcc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggttgcc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttcct gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatacg atggcctgtg tgaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttggtggttc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600
 cgtcgtctgc atcagaatca ggtg 624

<210> 29
 <211> 624
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 29
 cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcgcgtgcgg cttcgatcct accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcgggccc acaagccggt tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaagg ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggttgcc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttcct gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttattct tatgcctgtc ttaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttggtggttc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600

cgtcgtctgc atcagaatca ggtg

624

<210> 30

<211> 624

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 30

cgggggctgg tagcccaggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgategcac tcgctgtgg cttcgatcct accgctgaca gcttgcatTTT ggggcatcTT 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatacg atggcctgtt gtaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttgggtggtc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600
 cgtcgtctgc atcagaatca ggtg 624

<210> 31

<211> 624

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 31

cgggggctgg taccccaagt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgategcac tcacgtgtgg cttcgatcct accgctgaca gcttgcatTTT ggggcatcTT 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggt tgcgctggta 180
 ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcgatatt ggcaaact tctccgttaa ccagatgac 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcgtgag 480
 ttttcctaca acctgctgca gggttatacg tttgcctgta tgaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttgggtggtc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600

cgtcgtctgc atcagaatca ggtg

624

<210> 32

<211> 606

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 32

```

gtgacggacg aggaagcgtt agcagagcga ctggcgcaag gcccgatcgc actcacgtgt      60
ggcttcgata ctaccgctga cagcttgcac ttggggcatc ttgttccatt gttatgcctg      120
aaacgcttcc agcagggcggg ccacaagccg gttgcgctgg taggcggcgc gacgggtctg      180
attggcgacc cgagcttcaa agctgccgag cgtaagctga acaccgaaga aactgttcag      240
gagtgggtgg acaaaatccg taagcaggtt gccccgttcc tcgatttcga ctgtggagaa      300
aactctgcta tcgcggccaa taattatgac tggttcggca atatgaatgt gctgaccttc      360
ctgcgcgata ttggcaaaaca cttctccgtt aaccagatga tcaacaaaga agcgggttaag      420
cagcgtctca accgtgaaga tcaggggatt tcgttctactg agttttccta caatctgctg      480
caggggttatt cggctgcctg tcttaacaaa cagtacggtg tgggtctgca aattggtggt      540
tctgaccagt ggggtaacat cacttctggt atcgacctga cccgtcgtct gcacagaat      600
caggtg                                     606

```

<210> 33

<211> 624

<212> DNA

<213> artificial

<220>

<223> artificial synthetase

<400> 33

```

cgggggctgg tagcccaggt gacggacgag gaagcgttag cagagcgact ggcgcaaggc      60
ccgatcgcac tcgtttgtgg cttcgatcct accgctgaca gcttgcattt ggggcatctt      120
gttccattgt tatgcctgaa acgcttccag cagggcgggc acaagccggt tgcgctggta      180
ggcggcgca cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac      240
accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcaggttgc cccgttcctc      300
gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat      360
atgaatgtgc tgaccttctt gcgcgatatt ggcaaacact tctccgttaa ccagatgac      420
aacaagaag cgggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag      480
ttttcctaca acctgctgca gggttattcg atggcctgta cgaacaaaca gtacggtgtg      540
gtgctgcaaa ttggtggttc tgaccagtgg ggtaacatca cttctggtat cgacctgacc      600
cgtcgtctgc atcagaatca ggtg

```

624

<210> 34
 <211> 624
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<220>
 <221> misc_feature
 <222> (13)..(13)
 <223> n is a, c, g, or t

<400> 34
 cgggggctgg tancccaagt gacggacggg gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcagttgtgg cttcgacat accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggg tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggttg cccgttcctc 300
 gatctcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcatatt ggcaaacact tctccgttaa ccagatgatc 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480
 ttttcctaca acctgctgca gggttatagt tttgcctgtc tgaacaaaca gtacgggtgtg 540
 gtgctgcaaa ttgggtgggtc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600
 cgtcgtctgc atcagaatca ggtg 624

<210> 35
 <211> 624
 <212> DNA
 <213> artificial

<220>
 <223> artificial synthetase

<400> 35
 cgggggctgg tagcccagggt gacggacgag gaagcgtag cagagcgact ggcgcaaggc 60
 ccgatcgac tcacgtgtgg cttcgacat accgctgaca gcttgcattt ggggcatctt 120
 gttccattgt tatgcctgaa acgcttccag caggcggggc acaagccggg tgcgctggta 180
 ggcggcgcgga cgggtctgat tggcgacccg agcttcaaag ctgccgagcg taagctgaac 240
 accgaagaaa ctgttcagga gtgggtggac aaaatccgta agcagggttg cccgttcctc 300
 gatttcgact gtggagaaaa ctctgctatc gcggccaata attatgactg gttcggcaat 360
 atgaatgtgc tgaccttctt gcgcatatt ggcaaacact tctccgttaa ccagatgatc 420
 aacaaagaag cggttaagca gcgtctcaac cgtgaagatc aggggatttc gttcactgag 480

ttttcctaca acctgctgca gggttatacg tttgcctgta ctaacaaaca gtacggtgtg 540
 gtgctgcaaa ttggtgggtc tgaccagtgg ggtaacatca cttctggtat cgacctgacc 600
 cgtcgtctgc atcagaatca ggtg 624

<210> 36
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 36

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Tyr Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 37
 <211> 424
 <212> PRT
 <213> artificial

<220>

<223> artificial synthetase

<400> 37

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ile Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Met Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45
 Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60
 Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Met Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 39
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 39

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Met Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 40
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 40

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Thr Met Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 41
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 41

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Thr Tyr Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 42
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 42

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Leu Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Met Ala Cys Ser Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420
 <210> 43
 <211> 424
 <212> PRT
 <213> artificial
 <220>
 <223> artificial synthetase
 <400> 43
 Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Leu Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Met Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly, Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420
 <210> 44
 <211> 424
 <212> PRT
 <213> artificial
 <220>
 <223> artificial synthetase
 <400> 44
 Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15
 Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30
 Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45
 Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Arg Met Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Page 38

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Gly Met Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 46

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 46

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Gly Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Gly Phe Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
420

<210> 47
<211> 424
<212> PRT
<213> artificial

<220>
<223> artificial synthetase

<400> 47

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
20 25 30

Pro Ile Ala Leu Gly Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
165 170 175

Leu Leu Gln Gly Tyr Gly Tyr Ala Cys Met Asn Lys Gln Tyr Gly Val
180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 48
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 48

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15
 Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30
 Pro Ile Ala Leu Leu Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45
 Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60
 Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Met Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 49

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 49

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 Page 45

35

40

45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Ala Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 50

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 50

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Leu Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 Page 47

85

90

95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Ala Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 51
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 51

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys

130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Ala Ala Cys Val Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 52

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 52

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ile Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asp Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Asn Phe Ala Cys Val Asn Lys Gln Tyr Gly Val
 Page 51

180

185

190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 53
 <211> 424

<212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 53

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1' 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Ala Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 Page 53

225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 54
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 54

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Gly Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Ser Met Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu

275

280

285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 55
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 55

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Ala Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser

325

330

335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 56

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 56

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ser Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Thr Met Ala Cys Val Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile

370

375

380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 57

<211> 424

<212> PRT

<213> artificial

<220>

<223> artificial synthetase

<400> 57

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ala Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Tyr Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys

420

<210> 58
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 58

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ala Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Thr Met Ala Cys Cys Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 59
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 59

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15
 Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30
 Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45
 Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60
 Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Thr Phe Ala Cys Met Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 60
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 60

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60
 Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80
 Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95
 Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Val Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 61
 <211> 424
 <212> PRT
 <213> artificial.

<220>
 <223> artificial synthetase

<400> 61

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Val Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110
 Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125
 Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140
 His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Met Ala Cys Thr Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 62
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 62

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ser Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160
 Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175
 Leu Leu Gln Gly Tyr Ser Phe Ala Cys Leu Asn Lys Gln Tyr Gly Val
 180 185 190
 Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 63
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 63

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Thr Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Asp Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Thr Phe Ala Cys Thr Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205
 Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr
 210 215 220
 Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240
 Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255
 Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270
 Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285
 Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300
 Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320
 Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335
 Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350
 Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365
 Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380
 Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400
 Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415
 Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 64
 <211> 129
 <212> DNA
 <213> Escherichia coli

<400> 64
 agcttcccga taagggagca ggccagtaaa aagcattacc ccgtggtggg gttcccgagc 60
 ggccaaaggg agcagactct aaatctgccg tcacgcacct cgaagggttcg aatccttccc 120
 ccaccacca 129

<210> 65
 <211> 129
 <212> RNA
 <213> Escherichia coli

<400> 65
 agcuucccga uaagggagca ggccaguaaa aagcauuacc ccgugguggg guucccgagc 60
 ggccaaaggg agcagacucu aaaucugccg ucaucgaccu cgaagguucg aauccuuccc 120
 ccaccacca 129

<210> 66
 <211> 34
 <212> DNA
 <213> artificial

<220>
 <223> oligonucleotide primer

<400> 66
 atgaagtagc tgtcttctat cgaacaagca tgcg 34

<210> 67
 <211> 34
 <212> DNA
 <213> artificial

<220>
 <223> oligonucleotide primer

<400> 67
 cgaacaagca tgcgattagt gccgacttaa aaag 34

<210> 68
 <211> 33
 <212> DNA
 <213> artificial

<220>
 <223> oligonucleotide primer

<400> 68
 cgctactctc ccaaatagaa aaggtctccg ctg 33

<210> 69
 <211> 32
 <212> DNA
 <213> artificial

<220>
 <223> oligonucleotide primer

<400> 69
ctggaacagc tatagctact gatttttcct cg 32

<210> 70
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 70
gccgtcacag attagttggc ttcagtggag actg 34

<210> 71
<211> 33
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 71
gattggcttc ataggagact gatatgctct aac 33

<210> 72
<211> 33
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 72
gcctctatag ttgagacagc atagaataat gcg 33

<210> 73
<211> 35
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 73
gagacagcat agatagagtg cgacatcatc atcgg 35

<210> 74
<211> 37
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 74
gaataagtgc gacatagtca tcggaagaga gtagtag 37

<210> 75
<211> 35
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 75
ggtcaaagac agttgtaggt atcgattgac tcggc 35

<210> 76
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 76
cgctactctc cccaaattta aaaggtctcc gctg 34

<210> 77
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 77
cgctactctc cccaaatata aaaggtctcc gctg 34

<210> 78
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 78
cgctactctc cccaaatgga aaaggtctcc gctg 34

<210> 79
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 79
cgctactctc cccaaagata aaaggtctcc gctg 34

<210> 80
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 80
cgctactctc cccaaaaaaa aaaggtctcc gctg 34

<210> 81
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 81
gccgtcacag attttttggc ttcagtggag actg 34

<210> 82
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 82
gccgtcacag attatttggc ttcagtggag actg 34

<210> 83
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 83
gccgtcacag attggttggc ttcagtggag actg 34

<210> 84
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 84
gccgtcacag atgatttggc ttcagtggag actg 34

<210> 85
<211> 34
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 85
gccgtcacag ataaattggc ttcagtggag actg 34

<210> 86
 <211> 424
 <212> PRT
 <213> artificial

<220>
 <223> artificial synthetase

<400> 86

Met Ala Ser Ser Asn Leu Ile Lys Gln Leu Gln Glu Arg Gly Leu Val
 1 5 10 15

Ala Gln Val Thr Asp Glu Glu Ala Leu Ala Glu Arg Leu Ala Gln Gly
 20 25 30

Pro Ile Ala Leu Ile Cys Gly Phe Asp Pro Thr Ala Asp Ser Leu His
 35 40 45

Leu Gly His Leu Val Pro Leu Leu Cys Leu Lys Arg Phe Gln Gln Ala
 50 55 60

Gly His Lys Pro Val Ala Leu Val Gly Gly Ala Thr Gly Leu Ile Gly
 65 70 75 80

Asp Pro Ser Phe Lys Ala Ala Glu Arg Lys Leu Asn Thr Glu Glu Thr
 85 90 95

Val Gln Glu Trp Val Asp Lys Ile Arg Lys Gln Val Ala Pro Phe Leu
 100 105 110

Asp Phe Asp Cys Gly Glu Asn Ser Ala Ile Ala Ala Asn Asn Tyr Asp
 115 120 125

Trp Phe Gly Asn Met Asn Val Leu Thr Phe Leu Arg Asp Ile Gly Lys
 130 135 140

His Phe Ser Val Asn Gln Met Ile Asn Lys Glu Ala Val Lys Gln Arg
 145 150 155 160

Leu Asn Arg Glu Gly Gln Gly Ile Ser Phe Thr Glu Phe Ser Tyr Asn
 165 170 175

Leu Leu Gln Gly Tyr Gly Met Ala Cys Ala Asn Lys Gln Tyr Gly Val
 180 185 190

Val Leu Gln Ile Gly Gly Ser Asp Gln Trp Gly Asn Ile Thr Ser Gly
 195 200 205

Ile Asp Leu Thr Arg Arg Leu His Gln Asn Gln Val Phe Gly Leu Thr

210

215

220

Val Pro Leu Ile Thr Lys Ala Asp Gly Thr Lys Phe Gly Lys Thr Glu
 225 230 235 240

Gly Gly Ala Val Trp Leu Asp Pro Lys Lys Thr Ser Pro Tyr Lys Phe
 245 250 255

Tyr Gln Phe Trp Ile Asn Thr Ala Asp Ala Asp Val Tyr Arg Phe Leu
 260 265 270

Lys Phe Phe Thr Phe Met Ser Ile Glu Glu Ile Asn Ala Leu Glu Glu
 275 280 285

Glu Asp Lys Asn Ser Gly Lys Ala Pro Arg Ala Gln Tyr Val Leu Ala
 290 295 300

Glu Gln Val Thr Arg Leu Val His Gly Glu Glu Gly Leu Gln Ala Ala
 305 310 315 320

Lys Arg Ile Thr Glu Cys Leu Phe Ser Gly Ser Leu Ser Ala Leu Ser
 325 330 335

Glu Ala Asp Phe Glu Gln Leu Ala Gln Asp Gly Val Pro Met Val Glu
 340 345 350

Met Glu Lys Gly Ala Asp Leu Met Gln Ala Leu Val Asp Ser Glu Leu
 355 360 365

Gln Pro Ser Arg Gly Gln Ala Arg Lys Thr Ile Ala Ser Asn Ala Ile
 370 375 380

Thr Ile Asn Gly Glu Lys Gln Ser Asp Pro Glu Tyr Phe Phe Lys Glu
 385 390 395 400

Glu Asp Arg Leu Phe Gly Arg Phe Thr Leu Leu Arg Arg Gly Lys Lys
 405 410 415

Asn Tyr Cys Leu Ile Cys Trp Lys
 420

<210> 87

<211> 6

<212> PRT

<213> artificial

<220>

<223> tryptic peptide including unnatural amino acids

<220>

<221> MISC_FEATURE
 <222> (2)..(2)
 <223> X is an unnatural amino acid (p-acetyl-L-phenylalanine,
 p-benzoyl-L-phenylalanine, p-azido-L-phenylalanine,
 O-methyl-L-tyrosine, or p-iodo-L-phenylalanine) or tryptophan,
 tyrosine, or leucine

 <400> 87

 Val Xaa Gly Ser Ile Lys
 1 5

 <210> 88
 <211> 11
 <212> DNA
 <213> artificial

 <220>
 <223> B box

 <220>
 <221> misc_feature
 <222> (8)..(8)
 <223> n is a, c, g, or t

 <400> 88
 ggttcgantc c 11

 <210> 89
 <211> 82
 <212> DNA
 <213> artificial

 <220>
 <223> oligonucleotide primer

 <400> 89
 ggggggaccg gtggggggac cggtaagctt cccgataagg gagcaggcca gtaaaaagca 60
 ttaccccgtg gtgggttccc ga 82

 <210> 90
 <211> 90
 <212> DNA
 <213> artificial

 <220>
 <223> oligonucleotide primer

 <400> 90
 ggcggcgcta gcaagcttcc cgataaggga gcaggccagt aaaaagggaa gttcaggga 60
 ttttgaaaaa aatggtggtg ggggaaggat 90

 <210> 91
 <211> 68
 <212> DNA
 <213> artificial

 <220>

<223> oligonucleotide primer

<220>

<221> misc_feature

<222> (1)..(1)

<223> n=I

<220>

<221> misc_feature

<222> (14)..(14)

<223> n=I

<400> 91

nggggggacc ggtngggggg accggtcggg atcgaagaaa tgatggtaaa tgaaatagga 60

aatcaagg 68

<210> 92

<211> 62

<212> DNA

<213> artificial

<220>

<223> oligonucleotide primer

<400> 92

gggggggaat tcagttgatt gtatgcttgg tatagcttga aatattgtgc agaaaaagaa 60

ac 62

<210> 93

<211> 86

<212> DNA

<213> artificial

<220>

<223> oligonucleotide primer

<400> 93

tcataacgag aattccggga tcgaagaaat gatggtaaata gaaataggaa atctcataac 60

gagaattcat ggcaagcagt aacttg 86

<210> 94

<211> 72

<212> DNA

<213> artificial

<220>

<223> oligonucleotide primer

<400> 94

ttactacgtg cggccgcatg gcaagcagta acttggttact acgtgcgggc gcttattttcc 60

agcaaatcag ac 72

<210> 95

<211> 28

<212> DNA

<213> artificial

<220>
<223> oligonucleotide primer

<400> 95
ccgacgcgcg tcgcttgccg cttcgatc 28

<210> 96
<211> 27
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 96
atcgcgccga acgcctatga ctggctc 27

<210> 97
<211> 40
<212> DNA
<213> artificial

<220> -
<223> oligonucleotide primer

<400> 97
gttgcagggt tatgccgccg cctgtgcgaa caaacagtac 40

<210> 98
<211> 26
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 98
gccgctttgc tatcaagtat aaatag 26

<210> 99
<211> 21
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 99
caagccgaca accttgattg g 21

<210> 100
<211> 60
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 100

ggggacaagt ttgtacaaaa aagcaggcta cgccaatttt aatcaaagtg ggaatattgc 60

<210> 101
<211> 60
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 101
ggggacaagt ttgtacaaaa aagcaggcta ggccaatttt aatcaaagtg ggaatattgc 60

<210> 102
<211> 58
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 102
ggggaccact ttgtacaaga aagctggggtt actctttttt tgggtttggt ggggtatc 58

<210> 103
<211> 22
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 103
aagctatacc aagcatacaa tc 22

<210> 104
<211> 49
<212> DNA
<213> artificial

<220>
<223> oligonucleotide primer

<400> 104
acaaggcctt gctagcttac tctttttttt ggtttggtgg ggtatcttc 49